Tectonophysics

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8150 Piete tectonics GLOBAL PLATE MOTION RELATIVE TO THE SOT SPOTS 64 TO 56

MA
Donna H. Jurdy and Richard G. Gordon (Department of Geological Sciences, Northwestern University, Evenston, Illinois 60201)
We anamined the early Tertiary global plate velocities with respect to the hot spots, and compared these velocities both to those of present, and to early Tertiary velocities inferred by segming that momentorque is smerted on the lithosphers as a whole. In our reconstruction, the velocities of the Pacific and African plates were inferred directly from their hot aput tracks and the velocities of other plates with African plates were inferred directly from their bot aput tracks and the velocities of other plates with respect to the hot spots were calculated from the respect to the hot spots were calculated from the respect to the hot spots were calculated from the motion of the Facific or African plate and by relative notions estimated from seaflour spreading date. The relative cotion between seamed—separate morth Facific and south Facific (Chatham Sime) plates was estimated by asseming the hot spots in the Atlantic Ocean beets have been fixed with respect to those to the Facific Ocean beam, thereby avaiding the use of a poorly-defined relative cotion siterait. We found that the characteristics of early Tertiary plate motions with respect to the bot spots resemble these at present. The foot-exam-squere velocity of every major continental plate with respect to the bot spots during the early Tertiary exceeds its present velocity, but (with the exception of the indian plate) is less than the root-exam-squere velocity of every early Tertiary or anic plate. Equatorial lithosphere oved faster than point lithosphere during the early Tertiary, but the difference is less than at present. Over the interval 64 to 56 %, the no-mat-torque should velocities by only 0.007/Rs, which is insignificant. Thus, to dispard the acquired fixed-hot spot velocities by only 0.007/Rs, which is insignificant. Thus, to dispard in the velocities. We attribute the differences to be eather of the fixed that is disparded at the fixed to the spots yield similar strokung plate velocities. We attribute the differences to be such the plate where the difference to we show the entire which we show the entire the difference to we show the entire of the fixed that the difference is the stroken the difference fixed by a delective which where the difference is the shown here. (Not appears, plate wellocities which, Paleocean).

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The common polarisate of high-pressure tectonic terfalses slowly the Pastite count and other convergest margins supports that the syniation of subduction conplaces may be an impurement phase to the down loguest of

Vol. 65, No. 17, Pages 321-336

Solar Physics,
Astrophysics,
and Astronomy

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VERY LONG SOLAR VERTOOS AND THE RADIOCARDOV RECORD
G.P. Sonatt (Days of Piesetary Sciences and Lowar and Pinatery Laboratory, Univ. of Arisona, Tucson, Arizona, 85721)
Time variations in the atmospheric radiocarbon econd, empressed through the caboa-1's cancestraton in wood, discloses a mader of pariods in the interval from about 100 to several thousands of years. Though these are time variable, the statistics suggests their reality. These variables, the statistics suggests their reality. These vary long parted interplanatory consist ray socialities, in turn does to changes in the Sun's hydromagnetic output, as there is no observational evidence in the reage of pariods that the Zarth's field in responsible. Nor is a model the statistics researed (Radiocarbon, modulation of the helicappears invored. (Radiocarbon, modulation, Sun).

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continents. In this study, we model the steady-state theread thread in correct and cive audiocation complexes as lambing of moderate of the non-envoludation complexes as lambing to model the steady thread the security of the non-subduction complexes and blued tin deep subduction complexes as a lambing of the non-subduction complexes and subduction complexes and the action of the subduction complexes and the non-subduction complexes and the non-subduction complexes and the non-subduction complexes and the non-subduction complexes are the non-subduction complexes and the non-subduction converting the non-subduction converting of flow, radiogenic beatings in the sample of the non-subduction complexes and subduction complexes that the non-subduction complexes and subduction complexe

8150 Place tectonics THE DISTRIBUTION OF NOT SPOTS Michael Stefanick (Science Systems and Applications, Inc., 10210 Greenbelt Road, Seabrook, Maryland 20306), Donna M. Jurdy

Inc., 10210 Greenbeit Road, Seabrook, Maryland 20706), Domma M., Jurdy
Not speca have an irregular distribution over the earth's surface. Part of this irregularity is obviously due to the finite number (40-100) of hot spots, but the distribution does not appear to he completely rendom. In this paper statistical analyses are compared for two published hot spot data sars, one minimal set of 42 and another larger catalogue of 117. Three approaches are raken: 1) chi-square tests of equal area boxes, 2) cumularive distributions about principal axes, and 3) construction of a density

principal arms, and 3) construction of a density function. These methods all indicate that hot spots have a mon-mailform distribution, even when estatistical fluctuations are considered. To the first order, hot spots are concentrated on one-half the surface area of the earth; within that portion, the distribution is consistent with a uniform distribution. A prediction of hot spot density is used based on an empirical model rainting number of hot spots to plate appead. Comparison of this predicted density function to the constructed hot spot density functions for the two data sets yields spos similaricies; however, the observed hot spot densities for matter data set is

J. Geophys. Sem., B. Poper 4E0418

de tendion place) is loss than the evelocity of every certy Tertiary Equatorial lithosphere acceded fastor completes during the early Turtary, but is less than at present. Over the 55 %s, the normal-torque absolute velocities the saussed fixed-not apot who apot early turtary, but is less than at present. Thus, approaches, fixed-not apots and normal-clithosphere, when applied to identical colative plate velocities yield similar rejective by extens the attribute the difference of intervention of such acceptance of the content o

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Volcanology

K. H. Wohletz, I. K. Francis Science in and E. M. Jones (Earth and Space Science in Alexander, I. M. Jones (Earth and Space Science in Los Alamos National Laborator), Los Alamos National Laboratory, Los Alamos National Laboratory in the Control of National Laboratory in the Control of National Laboratory in the Califera-forming ash flow emptions may be sent the University of the Earth of the Ea

Priorities for Solar and Space Physics

The Space Science Board's Committee on Solar and Space Physics is presently preparing a report for NASA on the priorities for new space science programs in solar and pace physics, much as the Astronomy Survey (NAS-Field Report) and Solar-System Exploration Committees (NASA-SSEC Report) did for their respective disciplines.

This National Academy report is intended to define a program of space missions and associated ground-based activities that NASA should undertake from now through the 1990's that will make substantial advances in our understanding of the physics of the sun and heliosphere, space plasmas, magneto-spheres of the earth and other planets, and he ionosphere and upper atmosphere of the

The study will build upon previous reports and studies as well as input from the community. Those wishing to offer suggestions, poential experiments, or advice should contact the Committee Chairman, S. M. Krimigis (Applied Physics Laboratory), or one of the discipline working group leaders: Solar and Heliospheric Physics, G. Withbroe (Center for Astrophysics); Space Physics, R. Fredericks (TRW); Atmospheric Science, D. Strobel (Naval Research Laboratory). The Executive Secretary for the Committee is R. C. Hart,

The report is expected to be completed by

This news item was contributed by S. M. Krimigis of the Johns Hopkins University Applied Physics Laboratory in Laurel, A1d.

Yamato 791197

A second meteorite of probable lunar origin has been found among the several thousand meteorites recovered from Antarctica. It is number 791197 from the Yamato collection, which was recovered by an expedition from the Japanese Institute of Polar Research, Tokyo. The first meteorite of probable lunar origin (ALIIA 81005) was identified by Brian Mason in 1982.

Some meteorites may be leftover rock fragments from the nucleo-synthesis event that produced the solar system. It is also believed that some meteorites are the result of other meteorite impacts on either the moon or on Mars and that these samples were ejected into earth orbit. However, it is not clear if these samples could have escaped the gravity on

Yamato 791197 is a 25.4 gm specimen that was described recently by K. Yanai and H. Kojima at the Ninth Symposium on Antarctic Meteorites, held March 22–24, 1984, in Tokyo. The surface of the meteorite is encrusted with glassy fused rock material, which ap-parently is evidence of heating during its passage through the earth's atmosphere. Like ALHA 81005, this meteorite is classified as an impact breccia of anorthositic character. The chemical composition carries definite evidence of its being from the moon. Yamato 791 197 is specifically different from other generally similar meteorite groups such as eucrites and howardites.

The ratio of MnO to FeO is a characteristic fingerprint of lunar material. Olivines and pyroxenes from the Yamato sample fall within the appropriate hunar range (approximately 1770).— PMB

U.S. Wetlands

Although the overall rate that the nation's wellands are being converted to other uses is not alarming, the continued incremental conversion of wetlands, especially in certain inland regions of the country, may have significrise ecological effects over the next few decades. A comprehensive report on wetands, requested by the Senate Committee on Environment and Public Works, was released recently by Senator John H. Chafee (R-R.I.), chairman of the Subcommittee on Environmental Pollution. The report outlines options for new federal measures that could lead to more effective management of wetlands in the United States.

Federal efforts to manage wetlands could be more effective if they were focused on igher value wetlands, although, because the alue of individual wetlands in different regions of the country have not been evaluated at this time, priorities for protection have not been established.

The Office of Technology Assessment (OTA) has called for the federal government o continue or accelerate its ongoing mapping of wetlands, concentrating on areas under the greatest development pressure. The next step, OTA says, involves categorizing wetands according to their relative values by policymakers in cooperation with regional groups. In this way, existing wetland pro-grams can be more effectively focused on aigher value wellands. OTA suggests that

Congress could also broaden the scope of exmanaging the various leasing, regulatory, and acquisition programs. At present, decisions about wetlands use are most often based on

single values, such as wildlife habitat.

The U.S. Army Corps of Engineers' regulatory program, established by section 404 of the Clean Water Act, provides the major avenue of federal involvement in controlling wetland use by regulating discharges of dredged or fill material into wetlands. For Corps-regulated activities, annual conversions of wetlands were reduced by about 50,000 acres per

year, or 50% of the acreage applied for.
Conversions of inland, freshwater wetlands for agricultural purposes have been responsi-ble for 80% of the welland losses over the last 3 decades. Since the Corps' 404 program generally does not regulate these activities, 95% of the nation's wetlands, which are locate ed in inland areas, are not well protected by regulatory programs. OTA notes that most constal wetlands are reasonably well protected by a combination of section 404 and state regulatory programs.

There are about 90 million acres of vegetated wetlands remaining in the lower 48 states, with an additional 200 million acres classified as wellands in Alaska. Between the mid-1950's and the mid-1970's, the annual rate of conversion in the lower 48 states was about 550,000 acres a year. Because rates of agricultural drainage have declined, OTA esimates that annual conversions are now about 300,000 acres.—PMB

NSF Graduate **Fellowships**

Of the 540 college students offered fellow-ships by the National Science Foundation (NSF) this year for graduate study in 1984– 1985 in the natural and social sciences, mathematics, and engineering, 34 plan to pursue graduate studies in the earth, ocean, or space ciences. In addition, of the 60 NSF Minority Graduate Fellowships awarded this year, 2 were offered to students who plan graduate studies in the earth, ocean, and space sci-

Each fellowship, awarded for 3 years of graduate study, provides a stipend of \$8,100 per year for full-time graduate study. An annual cost-of-education allowance of \$4,900 is provided by NSF in lieu of all tuition and fees to the institution selected by each fellow for graduate study. The fellowships may be used over 5 years to permit students to incorporate teaching or research assistantships into their education during periods in which they are not receiving their fellowship stipends.

In addition to the NSF Graduate Fellowship awards offered this year, 974 individuals who received fellowship awards in previous years are eligible to continue their study dur-

ng the 1984–1985 fellowship year. Those students who were offered graduate fellowship awards this year to pursue graduare studies in earth, ocean, or space sciences are listed below with their proposed fields of study and the institutions chosen for gradu-

Geoffrey Alexander Abers, geophysics, California Institute of Technology (CalTech): Janet Maria Becker, oceanography, University of California, San Diego: Paul Arthur Berkman, biological oceanography, University of Rhode Island; Sara Cooper Brothers, geology, University of New Mexico; Carol Jacque-line Bryan, geophysics, University of California, Berkeley; Kelley Elaine Carlson, geooliysics, University of Minnesota, Jinneapolis; William Ward Chadwick, Jr.,

geology, University of California, Santa Barbara; Steven Gregory Crews, geology, Colora-do State University; Rebecca Jones Dorsey, geology, Cornell University; Mark Allen Falinestock, geology, Cal Tech; Steven Scott Fine, meteorology, Pennsylvania State University.
Tanya Helen Furman, geology. Massachusetts
Institute of Technology (MIT): John Patrick
Giltner, geology, University of Texas, Austin;
Robert Earl Grimm, Jr., geophysics, MIT;
Kristine Holderied, biological oceanography,
University of California, San Diego.

Samuel Warren Joffe, geophysics, Stanford University; Thomas Charles Juster, geology, University of Michigan; Meghan Willis Keith, geology, MIT; Michael Maier Keller, geochemistry, Princeton University; Kelly Lynn Kenison, oceanography, MIT; Walter Scott Kiefer, geology, CalTech; Bradley Siewart Meyer, astronomy, University of Illinois, Chicago; Stephen David Murray, astronomy, University of California, Santa Cruz; Jacque-line C. Mutschler, geophysics, Cornell Uni-versity; Jon Michael Nese, meteorology. Pennsylvania State University; Kirsten Peters, geology, Harvard University; Cynthia C. Piotrowski, geochemistry, CalTechi Laura Katlıryn Reilly, geochemistry, Pennsylvania State University; Michael Perry Rupen, astronomy, CalTech; Daniel Badger Seaver, geology, Philip H. Abelson, editor of Science, and University of California, Santa Barbara; Jona-Rep. Edward Boland, ranking member of the than Edward Snow, geochemistry, University House Appropriations Committee and chair-of Rochester; Michael Abram Strauss, astron-

isting wetland programs so that all of the natural values of wetlands are considered in cozky, geochemistry, MIT; and Rebecca Anne Williams, geology, Johns Hopkins University.

The minority fellowships are awarded to minority students of outstanding ability. More than 520 students who are American Indian, Black, Pacific Islander, or Hispanic submitted applications to the nationwide competition. Ernest Austin Jones, Jr., will study geology at Harvard University. Lisa
Diane White will study geology at Stanford
University. In addition to the NSF Minority Graduate Fellowship awards offered this year, 106 individuals who received fellowship awards in previous years are eligible to con-tinue their study during the 1984-1985 fellowship year.—BTR

In Congress: Upcoming Hearings

The following hearings and markups have tentatively been scheduled for the coming weeks by the Senate and House of Representatives. Dates and times should be verified with the committee or subcommmittee holding the hearing or markup; all offices on Capitol Hill may be reached by telephoning 202-224-3121. For guidelines on contacting a member of Congress, see AGU's Guide to Legtive Information and Contacts (Eos, April 17,

May 8: Mark up of Landsat commercialization bill (S. 2292) by the Senate Commerce, Science, and Transportation Committee. Russell Building, Room SR-253, 9:30 A.M. The House of Representatives passed its version of the Landsat commercialization bill (H.R. 5155) (Eos, April 17, 1984, p. 149) on April 9.

May 10: U.S. Geological Survey appropriations hearing for fiscal 1985 by the Interior and Related Agencies Subcommittee of the Senate Appropriations Committee. Dirksen Building, Room SD-138, 10 A.M.—BTR

Smithsonian Grants

The Smithsonian Institution has an nounced the deadlines for a fellowship in residence program and a foreign currency

grants program.
The residence fellowships support independent research and study in helds that are actively pursued by the various bureaus of the institution. The primary objective of the fellowships is to further the research training of scholars and scientists in the early stages of their professional careers. Proposals will be considered for research, among other topics. in earth sciences; paleobiology; ecological, behavioral, and environmental studies of tropical and temperate zones; and history of science and technology.

Individuals are selected competitively and are appointed to work under the guidance of professional staff members and to use the mithsonian's collections and facilities. Preand post-doctoral appointments have a 6- to 12-month tenure; graduate student appointments are for 10 weeks.

Stipends supporting awards are \$18,000 per year plus allowances for postdoctoral fellows: \$11,000 per year plus allowances for predoctoral fellows; and \$2,000 for graduate students for the 10-week appointme

Individuals interested in astrophysics or geophysical research should write to the Smithsonian Astrophysical Observatory, 60 Garden Street, Cambridge, MA 02138. For general information and for information on other fellowships fields, contact the Smithsonian Institution Office of Fellowships and Grants, L'Enfant Plaza, Suite 3300, Washington, DC 20560 (telephone: 202-287-3271 or 202-287-3321). The application deadline is January 15, 1985.

gram, a national research grants program, offers opportunities for support of research in Burma, New Guinea, India, and Pakistan in astrophysics, earth sciences, anthropology, archeology and related disciplines, systematic and environmental biology, and museum programs.

Awards are determined based on competitive scholarly review. Grants in the local currencies of the country where the research will be performed are awarded to American institutions for the resentelt of senior scientists. Collaborative porgrams involving host country institutions are welcome.

For additional information, write to the Foreign Currency Program, Office of Fellow-ships and Grants, Smithsonian Institution. Washington, DC 20560 (telephone: 202-287-3321). The deadline is November 1, 1984.

Geophysicists

pendent Agencies, will receive the Distin-guished Public Service Award of the National Science Foundation (NSF) at a dinner sponsored by the National Science Board on May 9. Abelson and Boland will be honored at a reception on May 8 as part of the NSF-spon-sored Science Week. Abelson has held numerous positions at the University of California at Berkeley, the Naval Research Laboratory, and the Carnegie Institution, which he headed as president from 1971 to 1978. He has been editor of the American Association for the Advancement of Science's weekly journal since 1962. Boland is a strong supporter of fundamental research, science and thematics education, and space sciences.

Barbara Fillmore has been selected to receive the Association for Women Geoscientists' National Officers Scholarship Award, which is presented to the outstanding woman geoscientist working in a degree program who has been an active participant in her profession and community. Filmore is currently completing a masters of science degree

in geology at the Colorado School of Mines.

Don Kirkham, a former professor of soil chemistry at Iowa State University, has been awarded the Wolf Prize for 1983-1984 from the Israeli-based Wolf Foundation. The \$100,000 prize, which he is sharing with agronomist Cornelis T. de Wit of Holland, is believed to be the largest prize for agricultur-

Ivan I. Mueller, has been appointed the chairman of the department of geodetic sciences and surveying at The Ohio State University from October 1, 1984, though September 30, 1988. Mueller was elected first vice president of the International Association of Geodesy at the 1983 General Assembly of the International Union of Geodesy and Geophysics.

In Memorian

The following AGU members are recently deceased.

Richard H. Jahns, 68, died December 31, 1983. An AGU Fellow and a member of the Volcanology, Geochemistry, and Petrology section, he joined AGU in 1945.

Sadami Matsushita, 64, died March 1-1, 1984. A member of the Solar-Planetary Relationships section, he joined AGU in 1955. Kiyotoshi Misawa, 45, died February 16, 1984. A member of the Solar-Planetary Relationships section, he joined AGU in 1969. Rocco S. Narcisi, 53, died March 27, 1984.

A member of the Solar-Planetary Relationships section, he joined AGU in 1969. Duane C. Simpson, 30, died January 19, 1984. A member of the Ocean Sciences section, he joined AGU in 1972.

Geophysical Events

This is a summary of SEAN Bulletin, 9(3), March 51, 1984, a publication of the Smithsonian Institu-tion's Scientific Event Alert Network. The complete bulletin is available in the microfiche edition of Eos as a microfiche supplement or as a paper reprint. For the microfiche, order document E84–004 at \$2.50 (U.S.) from AGU Fulfillment, 2000 Florida Avenue, N.W., Washington, DC 20009. For the paper reprint, order SEAN Bulletin (giving volume and issue numbers and issue date) through AGU Sepa-rates at the above address; the price is \$3.50 for one copy of each issue number for those who do not have a deposit account, \$2 for those who do; additional copies of each issue number are \$1. Subscriptions to SEAN Bulletin are available from AGU Fu fillment at the above address; the price is \$18 for 12 monthly issues mailed to a U.S. address, \$28 if mailed elsewhere, and must be prepaid.

Volcanic Events

Mauna Loa (Hawaii): Fissure eruption produces voluminous lava flows from NE rift vents; SOs-rich tropospheric plume reduces visibilities 7000 km away. Kilauea (Hawaii): Phases 16 and 17 include

strong fountaining, tephra, and the longest flow of the 1983-1984 eruption. t. St. Helens (Washi truded onto the composite lava dome. Veniaminof (Alaska): Vapor plumes and incandescence.

Pavlof (Alaska): Vapor plume to 6 km alti-

Nyamuragira (Zaire): Large lava flows and tephra ejection from flank fissure. Campi Flegrei (Italy): More vigorous sciamic-

ity: uplift continues.

Fernandina (Galápagos Is.): Caldera eruption; lava flow; SO2 plume detected.

Arenal (Cosla Rica): 43rd—16th lava flows since 1968.

Poás (Costa Rica): Fumarolé températures de-

El Chichon (Mexico): Plumes on satellite images not caused by eruptions. Suwanosejima (Ryukyu Is.): Summary of activity, November 1982-January 1984. Submarine Volcanoes (Volcano Is.): 1892-1983 observations.

Sakurajima (Japan): Tephra causes minor damage.

Rabaul (New Britain): Seismicity continues to

"News (cont. on p. 339)"

The Oceanography Report



The Oceanography Report The focal point for playwal, chemical, geological, and bio-

Editor: Arnold L. Gordon, Lamont-Doherty Geological Observatory, Palisades, NY 10064 (telephone 914-359-2900, ext. 325).

Information Report

Symposia on Chemical Oceanography

A continuing concern of the National Science Foundation (NSF), the Office of Naval Research (ONR), and the National Oceanic and Atmospheric Administration (NOAA) is the effective utilization of young scientists. To this end, these agencies are interested in becoming more familiar with the ideas being formulated by these individuals as they enter the field of occamography and independently important that these new graduates be in possession not only of the most recent information on the research climate and opportunities in their respective fields, but are provided an insight into the structure, missions, and modes of operation of the cosponsoring agencies of the symposia, as well as the procedures to follow in seeking support to conduct research from these agencies. As a result, the Marine Chemistry Program of NSF and the Chemical Oceanography Program of ONR were extremely receptive to a suggestion

made in October 1976 by E. D. Goldberg of the Scripps Institution of Oceanography that it would be useful to have a symposium convened which would be completely dedicated to soon-to-be or recent Ph.D. graduates in chemical oceanography. After discussions at some considerable length with members of the scientific community, preparations were set in motion for convening such a meeting, which was anticipated to be the first in a se-

Owing to the fact that the symposia were created for and are completely dedicated to the newest Ph.D.'s in chemical oceanography certain general guidelines were formulated. First, major professors of the participants and their departmental heads and deans would not be invited to attend the meeting. The reason for this was that we did not wish to run the risk of creating any barrier to open and frank discussions of papers being presented or to risk achieving the goals of the meeting by its being taken over by these individuals. Second, participation was limited to ensure that each participant had ample time to present his or her thesis research and that sufficient time was available for in-depth discussion and debate. Third, application to and selection for the meeting would be made on the basis of an extended abstract. These abstracts are to be printed in final form approximately I month after the close of the symposium, providing an opportunity for the au-thors to make any revisions as a consequence of the discussions that took place during the ting. These abstracts are as the cosponsoring agencies. Finally, time would be made available to the participants not only to initiate and hold informal sessions, but also to address certain topics raised by the agencies at the opening session. The results of these informal sessions would be presented by spokespersons of the groups

formed to address the assignments. It was felt that by bringing together, in scientific discussion and interaction, late stage chemical oceanography doctoral candidates, as well as new Ph.D.'s, professional relationships would be forged which would facilitate future interdisciplinary and interinstitutional investigations. It was also considered that the entire oceanographic community would become better aware of innovations in marine chemistry as a consequence of making young workers' efforts more visible. On the basis of the various types of data from the respective programs involved these objectives have been realized, and it may well prove to be rewarding to consider having similar symposia convened in the other subdisciplines compris-

ing the Ocean Sciences. The first Dissertations Symposia on Chemical Oceanography (DISCO) was convened in

NOAA joined in cosponsoring the symposia, which have been convened at approximately 18 month intervals, with coordination being provided in all instances by the American In titute of Biological Sciences (AIBS).

The fifth symposium was recently completed on March 9, 1984, and, again, was a complete success as viewed from both participants d spousors who attended. With the conclusion of this latest meeting, a total of 139 oung marine scientists representing 27 U.S. istitutions have had the advantage of participating in, and receiving the benefits of, these symposia. In discussing the desirability of continuing these meetings with the communi-ty at large, which obviously included former participants, the present enthusiasm is greater than at the beginning in 1978, and it is clear that these meetings are a community service.

During the period of these symposia, we have benefited from having 10 foreign participants, representing five countries (Belgium, rance, Japan, Norway, and Pakistan). Travel for these participants has been provided by both their national resources and the Intermental Oceanographic Commission (1OC) of UNESCO. Recently, the International Association for the Physical Sciences of the Ocean (IAPSO) has indicated that as an international scientific body they would be pleased to become associated with these meetings, and efforts have been initiated to obtain resources from an international organization to support foreign participation, in addition to the national resources noted above. Indeed, it would seem that this series of symposia is proving to be of value well beyond that

The sixth DISCO is now being planned and is anticipated to be convened from Octo ber 14 to 18, 1985. To be an invited speaker at the symposium, the applicant should have received his or her doctorate from an accredited university after October 1984 or, alternatively, his or her departmental chairperson or college dean must certify on the application form that in all probability the applicant will receive his or her degree before July 31, 1986. The applicant's thesis must deal with an important problem in chemical oceanogra-

Potential participants are urged to note the dates of this meeting and be alert to a further announcement which will appear in the scientific literature and the posting of information concerning obtaining applications, which will be given wide distribution to appropriate

This Information Report was contributed by Neil R. Andersen, National Science Foundation, Washington, D.C. 20550, and Frank L. Herr, Office of Naval Research, Washington, D.C.

News & Announcements

Research Ship Plans for 1985-1987

The University National Oceanographic Laboratory System (UNOLS), representing operators of American academic research ships, has established a National Expeditionary Planning Committee to coordinate planning of research ship cruises to remote areas, ship operations, and operations requiring fixed schedules of work. One essential part of this is to provide predictions of the areas in which the major research ships are likely to operate to make it possible for scien-tific investigators to do their own planning. This is, of course, a circular process: Some marine scientists have told us of their plans; these have resulted in tentative schedules. We plans into these schedules to use the ships more efficiently and to avoid unproductive

transit time. In the following list, ships are listed as working in their "normal operating area," areas close to home port if there are not present plans for them to work elsewhere. Gencralized routes are given for those ships for which there are plans for remote operations. All plans are of course subject to change. Scientific investigators interested in working on any of these ships should contact the ship-operating institution or the UNOLS office (William D. Burbee, UNOLS Office WB-15, School of Oceanography, University of Washington, Seattle, WA 98198).

R/V Knorr (Woods Hole): Normal operating area (north and equatorial Atlantic) during summers of 1985 and 1986. Work in far south Atlantic during winter of 1985-1986; may return north either through the Atlantic or the western Indian Ocean and Mediterranean. Time available for work en route in 1985 and 1986.

R/V Melville (Scripps): Normal operating area (northeast and central Pacific) 1985 through November and summer of 1986,

February 1978, jointly supported by NSF and ONR. Subsequent to the first meeting.

Possible meridional transects to and from Antarctic along 100° and 170° west in early 1978. Antarctic along 100° and 170° west in early 1986. Work in southern ocean (Atlantic and Pacific) in winter of 1986-1987, with transit runs either through eastern Pacific or south

R/V Atlantis II (Woods Hole): Northeast Pacific in early 1985. Atlantis II will carry the DSRV Alvin through 1985; its schedule is therefore tied to the Alvin schedule, which is not yet firm beyond the end of 1984. Atlantis // will be equipped with a SeaBeam system

R/V Conrad (Lamont): Will work in the torial Atlantic and Caribbean in early 1985, followed by East Pacific Rise work into San Diego by June. Transit to the western Pacific (Philippines, South China Sea) and Indian Ocean (north Australia) will be followed by availability in Indian Ocean or southern Indian-Atlantic ocean in late 1985 and earl 1986. A tentative schedule for further work in the Indian Ocean during mid-1986 will await proposals. Courad is principally outfitted for marine geophysical programs, with SeaBean and multichannel seismic system.

R/V Thomas Washington (Scripps): Starts 1985 in the south Atlantic; returns to eastern equatorial Pacific in May 1985. In fall-winter 1985 will probably make a loop via Hawaii to the southwest Pacific, to southeast Pacific. May return north in early 1986 through southeast Pacific for north Pacific operations. Will return south to Antarctic for the winter of 1986-1987. Equipped with SeaBeam; will carry two-channel digital seismic system for most of time.

R/V Thomas Thompson (University of Washington): Normal operating area (north Pacific north of about 25° north). Will work to Japan and back in 1985, has time available in the northwest Pacific.

R/V Moana Wave (Hawaii): Will start 1985 off the coast of Peru, work off western South America in early 1985, transit via Easter Island across the South Pacific to the Fiji area in mid-1985. Will work in the western and southwestern Pacific through October and then proceed to the South Atlantic via either western South America or the Indian Ocean in November or December. Early 1986 will be spent in the southern oceans and a return to Honolulu via the Indian Ocean and southwest Pacific is planned for the summer and fall of 1986. Moana Wave is being lengthened in 1984 and will carry a multichannel digital seismic system and SeaMARC. II in addition to general laboratory areas and deep sea trawl and hydrographic winches,
R/V Oceanus (Woods Hole): Normal operat-

ng area (North Atlantic). R/V Endeavor (University of Rhode Island): Normal operating area (North Atlantic), In 1985 will work between Equator and Iceland. In 1986 may work part of year in southeast

R/V Columbus Iselin (University of Miami): Normal operating area (western North Atlan-

R/V Gyre (Texas A&M): Normal operating area (western North Atlantic, Gulf, and Ca-R/V New Horizon (Scripps): Normal operating area (eastern north Pacific, California to

R/V Wecoma (Oregon State University): Normal operating area (northwest coast of United States). Will work south to Peru and

back in March-April 1985. This news item was contributed by George Shor, Jr., Chairman, UNOLS National Expeditionary Planning Committee, University of California, San Diego, Scripps Institution of Oceanogra-phy, La Jolla, CA 92093.

Symposium on Vertical Motion

A Symposium on Vertical Motion in the Equatorial Upper Ocean and Its Effects Upon Living Resources and the Atmosphere is to be held May 6-10, 1985, in Paris, France. This multidisciplinary international

Magnetic Reconnection

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symposium will address vertical motion in the equatorial upper ocean by bringing together leading researchers in or canography, meteo-rology, and fisheries. Papers are invited within the following topics: (1) generation, maintenance, and dissipation mechanisms of veni-cal motion; (2) relationship between changes in vertical motion and upper ocean heat content, sea surface temperature, and atmospheric planetary boundary layer variations: (3) instrumentation, observational techniques and data analysis methods; (4) relationship between vertical motion and mitrient enrich ment, biological productivity, and fisheries yield; (5) coastal upwelling in low-latitude regions; (6) the role of vertical motion in the 1982-1983 El Niño Southern Oscillation event; and (7) the relationship between vertical motion and the distribution of chemical

This symposium is organized by the Scientific Committee on Oceanic Research (SCOR) Working Group 56 and is cosponsored by the Intergovernmental Oceanographic Commission (IOC), SCOR/IOC Committee on Climater ic Changes and the Ocean (CCCO), and Division of Marine Sciences of the UN Education al, Scientific, and Cultural Organization (UNESCO). Members of the Symposium Organizing Committee are D. Halpern (Chairman), United States; R. Barber, United States; O. Guillen, Peru; D. Hu, People's Republic of China; R. Jimenez, Ecuador; A. Longhurst, Canada; H. Rotschi, Ivory Coast; and B. Voituriez, France. The language of the Symposium will be English.

Circular Number 1 was issued in March 1984, in which abstract, registration, and general information about the symposium is pro vided, can be obtained by writing to David Halpern, NOAA PMEL, 7600 Sand Point Way NE, Scattle, WA 98115.

The Pacific and Its Influence

A specially equipped scientific research ship and an Orion P-3 instrumented aircraft will be dispatched to the equatorial Pacific Ocean this spring by the National Oceanic and Atmospheric Administration (NOAA) to conduct in-tandem studies of the ocean's influence on, and relationship with, the atmo sphere. The NOAA ship Researcher will cruise the waters from Honolulu to Tahiti between May 14 and June 4, taking water and air measurements while the Orion aircraft sam ples the atmosphere overhead. After 3 weeks of data collection, scientists hope to gain new knowledge about how the ocean is involved in such phemomena as acid rain, El Niño, and the "greenhouse" buildup of carbon dioxide.

The project will support a series of five interlocking scientific experiments. To try and answer the question of why rain acidity is of ten as high in the remote ocean as it is in some coastal areas, one of these experiments will investigate concentrations of sulfur and other chemicals in the water column and at the atmosphere's boundary with the ocean. Another experiment deals with carbon dioxide and how it is transferred at the sir-sea interface, a step in trying to understand the global "greenhouse" effect that is believed to e warming up the earth's climate.

Two more studies will gather data on trade winds in the equatorial zone and on the orbulent updrafts and downdrafts that transfer heat across the alr-water boundary. The fifth experiment is an investigation of the thermocline boundary layer that separates cold, oxygen-poor waters from the warmer waters

ibove them. These last two investigations will also feed data into NOAA's multi-year EPOCS (Equatorial Pacific Ocean Climate Studies) program, a broad effort by climatologists to understand the variation of sea surface temperatures in the tropical Pacific from season to season and from year to year. The hope this program will shed new light on global climate patterns and how they are occasionally disrupted by events such as last year's

in Space and Laboratory Plasmas (1984) Geophysical Monograph Volume 30 Edited by Edward W. Hones, Jr. ISBN 0-87590-058-5 408 pages \$33 AGU members receive Write: American Geophysical Union a 30% discount 2000 Florida Avenue, N.W. Washington, DC 20009 Call: 800-424-2488 202-462-6903 (in DC area Western Union or outside contiguous USA). 710-822-8300

News (cont. from p. 337)

intensify; deeper, stronger carthquakes; 2 seismic criscs. Manam (Bismarck Sea): Strombolian jets. glowing avalanches, scoria flows. Langila (New Britain): Activity low; explosions at middle and end of month. Ulawun (New Britain): Explosions and January seismic crisis 3-month summary.

Bagana (Solomon Is.): Sounds, glow, tephra emissions; but no new lava flows. Atmospheric Effects: Acrosols persist at mid-

latitudes; sunset reports. Mauna Loa Volcano, Hawaii (19.47°N, 155.61°W). All times are local (= UT-10

The following (except for the plume data) is from the USGS Hawaiian Volcano Observatory. Times noted below are preliminary and subject to slight revision after later analysis. The USGS will provide a more detailed report of the cruption for a future issue of

A flank eruption began on March 25 and had ended by April 15. Simultaneous cruptions on March 30 at Mauna Loa, Kilauca, Mt. St. Helens, and Veniaminof make this the first date known on which four U.S. volcanoes were crupting at the same time.

Summit inflation had continued since Mauna Loa's last eruption July 5-6, 1975. Based on an increase in the rate of geodetic change and seismic activity, Decker et al. (Eos, September 13, 1983) called attention to the "increased probability of a Mauna Loa eruption within the next 2 years."

There was almost no short-term instrumen tal warning of the eruption. Seismic activity had been increasing gradually through March, but only 29 microearthquakes were recorded beneath the summit caldera in the 24 hours before the eruption (in contrast to 700 microearthquakes per day in September 1983). At 2255 on March 24, a small earthquake swarm began directly beneath the summit and weak harmonic tremor was recorded from the summit station at 2330. Tremor amplitude and the number of earthquakes increased about midnight, and borehole tiltmeters recorded the onset of rapid summit inflation at 0100.

A military satellite detected a "strong" infrared signal from the summit at 0125, and glow was sighted from the ground 4 min later. Lava fountaining began in the caldera and upper southwest rift, but eruption fissures nigrated down the northeast rift before dawn. All dikes were emplaced within the first 15 hours of the eruption, at propagation rates that varied from 2500 m/hour down the SW rift zone to about 1200 m/hour in lower parts of the NE rift zone (Figure 1).

By March 26 all lava production was concentrated along a 500-m fissure segment near 2900 m altitude, about 15 km NE of the summit area (Figure 2). Approximately 80% of the lava production fed flow 1, which moved rapidly northeast toward Hilo March 27-28 (Figure 3). Significant advance of the front of flow I stopped by early March 29, more than 7 km from the nearest homes, although production at the vents remained essentially constant. When weather cleared March 30, a new branch flow (1A) was advancing quickly N of flow I, but it slowed the next day as it thickened and widened upstream and the feeding channel became sluggish. Slow advance con-tinued until April 5, when a major overflow at about 2000 m altitude shut off most of its lava supply and fed a fast-moving flow (1B). Lava production decreased by about 50% during the nights of April 8-9 and subsequent activity fed flows that did not move far vnslope. The rate of outflow gradually decreased and the eruption had ended by early

The eruption produced a large gas plume that was carried thousands of kilometers to the W by trade winds. There was no evidence that the plume reached the stratosphere. By March 30, a haze layer was detected at Wake and Johnston Islands (1400 and 3900 km from Mauna Loa) and had reached Guam (6300 km to the WSW) by April 2, SOr emit ted by Mauna Loa was detected by the TOMS instrument on the Nimbus 7 polar orbiting satellite, which passed over Hawaii daily at about local noon. From the TOMS data, preliminary estimates of the total SO2 in the Mauna Loa plume were roughly 180,000 metric tons on March 26 and 190,000 tons on March 27.

The 1984 basalt was very fine-grained with widely scattered (<<1%) phenocrysts of olivine (most Fo 88-90) and sparse microphenocrysts of plagioclase and clinopyroxene. Maximum temperatures determined repeatedly by thermocouple and radiometer ranged from

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Cover. Magnetic reconnection is a process, important in systems of magnetized as, by which differently directed field lines link up, allowing topological changes of the magnetic field to occur, desulting in conversion of magnetic energy to kinetic and thermal energy of the plasma. The cover figure demonstrates quite similar consequences of magnetic reconnection that are found in the vastly different environments of a comet, earth's magnetosphere, and a laboratory fusion experiment. (Top) Yerkes Observatory photographs of Comet Morehouse before and after its plasma tail was severed by magnetic reconnection near the comet's head in what is called a "disconnection event" (DE). A comet's plasma tail is created by an accumulation of solar wind magnetic field lines that drape around the comet's head. In a DE, the solar wind

plasma and energy that have been stored gradually in the tail during its generation are suddenly released and returned to the solar wind. (Middle) The plasma sheet (shaded) in the tail of earth's magnetosphere is suddenly severed near the earth y magnetic reconnection. This creates a plasmoid (a system of closed magnetic loops) that flows rapidly away through the tall, carrying a vast amount of plasma and

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energy earlier acquired from the solar wind. Such episodes of plasmoid genera-tion and release to the solar wind were dramatically confirmed by ISEE 3 satellite observations at 1.4 million kilometers from earth and are thought to be the underlying physical process in magnetospheric substorms. (Bottom) Axial cross section of the field-reversed 0-plnch experiment, FRX-C/T at the Los Alamos National Laboratory, showing translation of a field reversed configuration (FRC) from the left section of the cylindrical container, where it was formed, into the "drift tube" section at right. The FRC (shaded), a cylindrical plasmoid, was formed near Z = 0 m by magnetic reconnection when an Initial B_z (axial) field was entrapped in plasma and then compressed, at $t = 0 \mu s$, by a fast-rising B_i , field of opposite sign (by courtesy of D. J. Rej, Los Alamos National Laboratory). In the middle and bottom panels the lines with black acrows are tom panels the lines with black arrows are magnetic field lines and white arrows indicate the direction of plasma flow. (Further discussion of these phenomena can be found in Magnetic Reconnection in Space and Laboratory Plasmas, Geophysics Monograph Series, vol. 30, members \$25.10, nonmembers \$33.00; published by the American Geophysical Union.)(See Hones article this issue.)

Vents below Vents below Dewey Cone --- - Eruptive Vents below Fleaure Pohaku Hanale ----- · Crack Zone Migration down upper NE Rift Zon ligration across Mokusweowed digration down SW Rift Zona Distance (km from 1940 cone)

Fig. 1. Rate of propagation of eruption fissures, shown as distance from the 1940 cone (in the SW part of the summit caldera; see Figure 2) versus time in hours after the start of

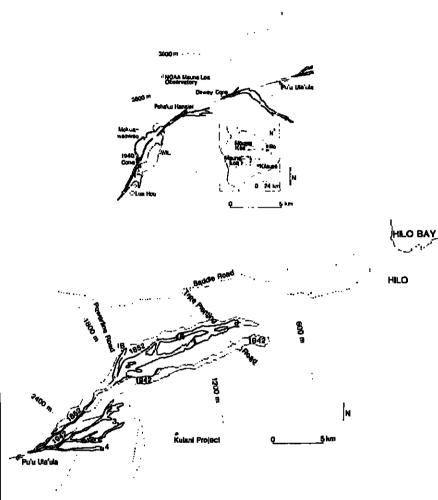


Fig. 2. Maps of the summit area and northeast rift zone of Mauna Loa. Eruption lissures are indicated by hachured lines and 1984 lava flows are stippled. Contours are approximately 600 m apart. The edge of the suburbs of Hilo is shown by a dotted line.

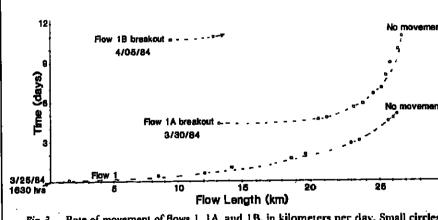


Fig. 3. Rate of movement of flows 1, 1A, and 1B, in kilometers per day. Small circles represent observations of flow positions.

Phase 17 of Kilauca's cast rift zone cruption began March 30 but had no apparent effect on Mauna Loa activity. Likewise, Kilauca tilt showed no deflection as the Mauna Loa

eruption began March 25.
Information Contacts: J. Lockwood and staff, USGS Hawalian Volcano Observatory Hawaii Volcanoes National Park, HI 96718 J. M. Rhodes, Dept. of Geology, University o Massachusetts, Amherst, MA 01003; Michael Garcia, Dept. of Geology and Geophysics, University of Hawaii, Honolulu, 111 96822; Tom Casadevall, USGS Cascades Volcano Observatory, 5400 MacArthur Blvd., Vancouver, WA 98661; Arlin Krueger, Code 963, NASA Goddard Space Flight Center, Greenbelt, MD 20771; Michael Matson, NOAN NESDIS, Room 510 World Weather Bldg.,

Washington, DC 20233. Fernandina Caldera, Galapagos Islands (0.37°S, 91.55°W). All times are local (= UT-6

At 0500 on March 30, Oswaldo Chapi and Fausto Cepeda (of the Galapagos National Park) heard noise from Fernandina Caldera, 22 km SW of their position at Tagus Cove.

Glow was visible over the NW end of the caldera, and a cloud was seen issuing from the same location after sunrise. The cruption was described as being smaller than the Volcan Wolf cruption of 1982 (see SEAN Bulletin,

The TOMS instrument in the Nimbus 7 polar orbiting satellite detected SO2 produced by the eruption April 1 and 2. No data were available March 30-31, and SO2 had dropped below the detection threshold by April 8. Strongest values on April 1 were directly over the volcano, and a preliminary estimate of to-tal SOs was 60,000 metric tons. No eruption cloud was evident on NOAA weather satellite

magery.

On the afternoon of April 4, the cruise ship Santa Cruz reported a long plume of vapor coming from the caldera, but apparently decreasing in size. They looked for glow over the volcano that night but reported none. On April 11, Fernandina was climbed from the NW by David Day and L. Peterson; who

reported an apparently inactive lava flow

News (cont. on p. 340)

News (cont. from p. 339)

reaching from the western side of the caldera (near the site of the major eruption of 1968) to the lake. At 0650 the next morning, Day and Peterson heard a noise "like a large landslide" from their camp near the western caldera rim. Within 30 s, they reached the rim in time to see what Day described as a nuce ardente that had already moved from the vent area halfway to the lake. They left the rim, and observers from Purita Espinoza, 17 km to the NE, described an eruptive cloud rising at 0655 to an estimated height of about 7 km. At 0704, Day and Peterson were overtaken by an ash rain described as "raindrops with ash," and total darkness persisted until 0720. A thickness of 3 mm of tephra accumulated during that period at their rin camp. By 0725 it was clear enough to see into the caldera. Tephra covered the new lava on the caldera floor with the exception of an area a few hundred meters across in which molten

rim at 1030, and no further volcanism had been witnessed at the time of their radio report, at 1500 on April 13, from Punta Espin-

This is the sixth known eruption of Fernandina since the major explosive eruption and massive caldera collapse of 1968. The last erception was not recognized in the Galá-pagos, but its products are visible in an aerial tograph taken March 26, 1982. From a 900-m-long circumferential fissure on the S rim of the caldera, flows moved both inward (N) down the calders wall and over a high topographic bench, and outward (S) where the ow ponded behind another row of circumferential vents. The eruption had not yet taken place when Tom Simkin and others passed this area on December 4, 1980.

Information Contacts: Gunther Reck, Director, Charles Darwin Research Station, Isla Santa Cruz, Galápagos Islands, Ecuador; Lucho Maldonado, Metropolitan Touring, P.O.

lava could be seen. Day and Peterson left the Box 2542, Avenida Amazonas 239, Quito, Ecuador; David Day, Isla Santa Cruz, Galápugos Islands, Ecuador; Arlin Krueger, Code 963, NASA Goddard Space Flight Center, Green-

helt, MD 20771; Michael Matson, NOAA/ NESDIS, Room 510, World Weather Bldg. Washington, DC 20233.

Earthquakes

Date	Time, UT	Magnitude	Latitude	Longitude	Depth of Focus	Region
March 5	0934	6.7 m _h 6.5 m _b 7.0 M _S 7.0 M _S 6.5 M _S	8.14°N	123.77°E	651 km	Mindiuao, Philippines
March 6	0217		29.36°N	138.87°E	-457 km	S of Honshu, Japan
March 19	2029		40.28°N	60.34°E	-30 km	Central Turkmen SSR
March 24	0944		44.19°N	148.21°E	shallow	S Kuril Islands
March 27	2007		4.58°S	145.79°E	-12 km	Papua New Guinea

Information Contact: National Earthquake Information Service, U.S. Geological Survey. Stop 967, Denver Federal Center, Box 250 l6, Denver, CO 80225.

Meteoritic Events

Fireballs: Czechoslovakia; Italy; Portugal; Alaska, Hawaii, Oregon, Pennsylvania, Tennessee, Washington, SF, USA.

Books

Magnetic Reconnection in Space and Laboratory Plasmas

E. W. Hones, Jr. Los Alamos National Laboratory, Los

AGU is publishing Magnetic Reconnection in Space and Laboratory Plasmas, as volume 30 of

the Geophysical Monograph Series (members \$23.10; nonmembers \$33.00). This volume is based on the Chapman Conference on Magnetic Reconnection, which was held at the Los Alamos National Laboratory in October 1983. Organization of that conference was first considered in early 1981, at a time when the body of evidence for the occurrence and importance of magnetic reconnection in earth's magnetosphere had already become impressive and was continuing to increase rapidly. There had not been a major conference on the subject since 1977, and the intervening

years had seen important new strides being made. Initial plans called for holding the conference in October 1982, but conflicts with other conferences forced its postponement for I year. The 1-year postponement turned out to be a blessing in disguise because it permitted major new magnetospheric observa-tions, made during that year by the ISEE 3 satellite, to be reported at the conference.

ISEE 3 was launched in 1978 into a halo orbit around the sunward Lagrangian point where for the next 4 years it served as a solar wind monitor. In late 1982 it was transferred

to earth orbit where, by means of lunar gravity assist maneuvers, it executed several trajectories through the far magnetotail reaching down-tail distances as great as 220 R_F (1.4 x 100 km), about 3 times farther than systemat ic observations of the magnetotail had ever been made before (see Eos, 64, 929, 1983). Data returned from that distant tail location contained compelling new indications of the important role of magnetic reconnection in the magnetosphere. One of the most remarkable of these was the observation of large plasmoids (plasma structures threaded with

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EVIDENCE FOR THE OCCURRENCE AND IMPORTANCE OF RECONNECTION BETWEEN THE BARTH'S HACKETIC FIELD AND THE INTERPLANETARY MACHETIC FIELD

NOW CONSIDER DIFFUSION J. W. Dungey DEPINITION OF A SUBSTORM, PHYSICAL PROCESSES IN A SUBSTORM AND SOURCES OF DISCOMPORT G. Rostoker

closed magnetic field loops) moving very rapidly down the tail past the satellite in association with magnetospheric substorms. The plasmoids are thought to be sectors of the magnetotail plasma sheet that have been severed by magnetic reconnection occurring near the earth. That plasmoids are created and released during substorms had been inferred previously from satellite data aconired much closer to earth, so their actual observation with ISEE 3 constituted a most dramatic confirmation of that earlier idea. This phenomenon is depicted on the cover of this issue of Eor along with illustrations of analogous effects of magnetic reconnection that are seen in comets and that are produced in laboratory fusion experiments. The identification of the passing plasmoids was made in ISEE 3 measurements of magnetic fields, energetic particles, and plasma. These and other ISEE 3 observations were tenorted for the first time at the conference and are published

in the monograph. This mortograph is, I believe, the first book dedicated entirely to the subject of magnetic

reconnection and thus should satisfy the present need for a convenient and thorough source of information and references. There is good balance between review papers, pa-

reconnection has traditionally been taken. cluded in the monograph. Two other features of the book will, I think, heighten reader interest. First, questions and answers recorded after the talks are included in the

text. Second, the final half-day summary and appraisal session of the conference was taperecorded, and its transcript (with a minimum

video tape on which he presented the talk he

had wanted to deliver in person. The tape

cumbed to his long illness in January 1984. Edward W. Hones. Jr., received his Ph.D. in physics from Duke Uni-

was played for the conference participants

est has been the physics of the earth's magnetosphere. Using data from particle and plastosphere. Using data from particle and plastona instruments developed by Los Alamos science for the contract of the property of the contract of the co entists for the Vela satellites and NASA's IMP.

Classified

RATES PER LINE

6. 7, and 8 satellites he did pioneering studies

relating geomagnetic and auroral activity to

the magnetosphere's dynamical behavior in the flowing solar wind. Those studies contrib-

uted importantly to the evolution of the present solar wind-inagnetosphere interaction

theory in which magnetic reconnection is a

studies continue through collaborations with

fundamental process. His magnetospheric

several scientific institutions, most recently

using improved observations with NASA's [SEE 1, 2, and 3 satellites.

Items listed in New Publications can be or-

dered directly from the publisher; they are

Developments in Soil Mechanics and Foundation

Engineering, 1, Model Studies, P. K. Banerjee and R. Butterfield (Eds.), Applied Science, New York, xii + 266 pp., 1984, \$59.25.

Dictionary of Petrology, S. I. Tomkeieff; E. K. Walton, B. A. O. Randall, M. H. Battey, O.

Tomkeieff (Eds.), John Wiley, 680 pp.,

English-Russian Dictionary of Applied Geophysics, B. V. Gusev, N. N. Zefirov, Λ. S. Petukhov,

K. Kupalov-Yaropolk, Pergamon, New York, x + 488 pp., 1984, \$50.

Explosive Volcanism: Inception, Evolution, and Hazards, Studies in Geophysics, National Academy Press, Washington, D.C., xii +

Global Biogeochemical Sulphur Cycle: Scope 19, M. V. Ivanov and J. R. Freney (Eds.), John Wiley, New York, xiv + 470 pp., 1983,

Index of Earth Resources: Observation Systems (poster), compiled by C. S. Southworth, U.S. Geological Survey, Reston, Va., no

Laser Remote Sensing: Fundamentals and Appli-cations, R. M. Measures, John Wiley, New

Politics of Mineral Resource Development in Ant-

arctica: Alternative Regimes for the Future, W.

E. Westermeyer, Westview, Boulder, Colo.,

Proceedings of the Fifth Symposium on Polar Me-

lar Research, Tokyo, v + 227 pp., 1983.

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teorology and Glaciology: Special Issue, No. 29, K. Kusunoki (Ed.), National Institute of Po-

York, xii + 510 pp., 1984, \$44.95.

xv + 267 pp., 1984., \$22.50.

New Publications

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176 pp., 1984, \$24.50.

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POSITIONS AVAILABLE

Air Force Geophysics Laboratory Geophysics Scholar Program (1984–1985). The Air Force Geophysics Laboratory (AFGL) and The Southeastern Center for Electrical Engineering Education (SCEEE) announce that applications are invited for research appointments during the 1984–1985 year in the Geophysics Scholar Program. This program provides research opportunities of 10 to 12 months duration for selected Engineers and Scientists to perform research in residence at the AFGL, Hanstom AFB, near Boston, Massachusetts. Scholars will be selected primarily from such fields as Geophysics, Atmospheric Physics, Meteorology, Ion Chemistry, Applied Science, Mathematical Modeling using Computers, and Engineering.

try, Applied Science, Mathematical Moteling using Computers, and Engineering.

To be eligible, candidates must have a Ph.D. or equivalent experience in an appropriate technical field. Some appointments may be confirmed prior to August 1984 so early applications are encouraged. All qualified applicants will receive consideration without regard to race, color, religion, sex, or national origin. Application Deadline for September Appointments: August 1, 1984. For further information and application forms contact: SCEEE, 1101 Massachusetts Avenue, St. Cloud, FL 32769 Telephone: (305) 892-6146.

phone: (305) 892-6146. SCEEE supports Equal Opportunity/Affirmative

Postdoctoral Fellow in Atmospheric Science. A position will be available beginning October 1, 1984, at the Harvard-Smithsonian Center for Astrophysics for theoretical analysis of the Shuttle glow and studies of upper atmosphere physics and themistry. A Ph.D., which involved research in aeronomy, is requited, Send applications and names of three references in: A. Dalgarno, Center for Astrophysics, 60 Garden Street, Cambridge, MA 02138.

Positions in Nuclear Waste Disposal Project.(Argonne, Illinois, location) The Project Management Division of Banelle Memorial Institute has immediate openings in its Office of Cristilline Respository Development for a Geohydrologist and a Geostatistician to work on the contract for the development of a high-level nuclear waste respository in deep crystalline rock formation. GEOHYDROLOGIST

Responsibilities include detailed multi-dimensional simulations of fluid flow, heat flow, solute transport and radiomulide transport in multi-acquifier systems as part of the performance assessments of potential nuclear waste repository sites. Requirements include: • M.S./Ph.D. in hydrology/related field.

Experience in flow and transport modeling of large geohydrologic systems.
 Hands-on computer modeling and programming background.
 Excellent oral and written continunications skills.
 GEOSTATISTICIAN

Perpopulatibilities include the development of sensi-

Responsibilities include the development of sensitivity and uncertainty analysis methodology (including Monto Carlo and Latin Hypercube) for existing expunse; roles of ground-water flow, radiomelide computer codes of ground-water flow, radionuclide transport, and thermal, mechanical, and chemical processes; sensitivity and uncertainty analyses with these codes as part of performance assessments for potential nuclear waste repository sites, and geostatistical analyses (including kriging) of spatially distributed geologic and hydrologic data. Require-ments include:

distributed geologic and nydrologic data. See ments include:

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Rosalind Drum

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I opportunity/affirmative action employ-Geoscience Data Manager and Staff/Texas A&M

Goscience Data Manager and State (Intersity, Goscience Data Manager and State, Ocean Drilling Program, Texas A&M University, to assemble and monitor all of the electronic film and paper data collections produced on the drilling vessel and during subsequent shore studies, including quality control, preparation of data syntheses and documentation, response to user requests, and support of research activities. Geoscience bachelors or masters degree required. Experience in data base operations desirable. Total of three positions to be filled. Send a letter of application, resume, names of four referees, and other relevant information to: Dr. Russell Merrill, Curator and Manager of Science Services

Ocean Drilling Program
P.O. Drawer GR
College Station, Texas 17843

College Station, Texas 77843 Application deadline is June 1, 1984.

Southwest Research Institute/Ion Mass Spectrometry. A senior staff position is available in the Southwest Research Institute's Department of Space Sciences for a Ph.D. level experimental physicist to work in space-borne ion mass spectrometry. The successful applicant will have the opportunity to develop ion mass spectrometers for spacecraft missions in the earth's magnetosphere as well as to cometa and planetary magnetospheres. The position requires significant experience in magnetic ion mass spectrometry and in microchannel-plate imaging detector systems. Contact 31.L. Burch, Southwest Research Institute, P.O. Drawer 28510, San Antonio, TX 78284, telephone 512-684-5111, extension 2526, or Bill Crumleit. Personnel Department, extension 2072.

Assistant Researcher/University of Hawaii. The Hawaii Institute of Geophysics, Planetary Geosciences Division is accepting applications for one to three positions full-time, lederal funds, to begin between June 1. 1984 and January 31, 1985, for a period of one year, annually renewable pending federal funding, DUTIES: The incumbent(s) will develop and utilize physical remote measurements of planetary surfaces and laboratory measurements of appropriate materials to study the composition, structure, and physical processes operating; and also evolution of planets, satellites, asteroids and comets. Emphasis is to be on optical spectroscopy and surface composition for asteroids, comets, Galilean satellites and terrestrial planets. The incumbent(s) is expected to develop an independent research programs. MINIMUM QUALIFICATIONS: Ph.D. in earth and planetary sciences or a closely related field; experience in acquisition, processing and interpretation of multi-spectral and spectroscopic data; working knowledge of evolution and present state of the planets and of rock-forming minerals (including ices) and their optical properties. DESIR-ABLE: Experience with electro-optical instrument development and operation, large array computer processing, spacecraft experiments and supervision of technical staff and graduate students. SALARY: Minimum \$20,208/annual; maximum \$50,350/annual. INQUIRIES: Applicants should send a cover letter describing qualification and experience with their vitae to Dr. Thomas B. McCord, Planetary Geosciences Division, HIG, University of Hawaii, 2552 Correa Road, Honolulu, Hawaii 96822. CLOS-ING DATE: September 30, 1984.

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Eastern Illinois University/Department of Geography & Geology: Teaching Position in Geology.

The Department of Geography/Geology at Eastern Illinois University is accepting applications for a temporary one year position in geology starting August 25, 1984. Chances are very good that this position will become full-time tenure track. A Ph.D. is required. Rank will be at the assistant professor level. The candidate will be expected to teach physical or historical geology. Preference will be given to those candidates who can teach one or more of the following: an introductory course in geophysics, economic minerals, structure, hydrology, and field geology. Other specialties will definitely be considered. If the position becomes permanent, teaching at summer field camp and the pursuit of research will be expected.

vill be expected.

The Department has six full time geologists and opproximately 120 undergraduate geology majors.

APPLICATION PROCEDURES:

APPLICATION PROCEDURES:
(1) Application deadline is May 31, 1984 (early completion of application is encouraged)
(2) Individuals wishing to apply should insmediately make their interest known to:
Dr. Gary Wallace, Chairman
Department of Geography and Geology
Eastern Illinois University
Charleston, Illinois 1920
1 elephone: office—(217)581-2026; home—
(217)345-4772
13) Candidates should submit the following mate

13) Candidates should submit the following materials to the above address as soon as possible
a) Letter of application

b] A current vita c] Transcripts from all institutions from where col-lege credits have been earned d] Arrange for three letters of recommendation to to sent Scut manys, advices a recommendation to be sent Scut manys, adviceses, and deplication numbers of referees with letter of application. Eastern Illmois University is an affirmative action and equal employment opportunity employer.

Ph.D.-Geochemist/Hydrogeologist. Research Planning Institute, Inc., a growing scientific consulting company, will hire a geochemist/hydrogeologist to work on terrestriat and marine pollution projects strong field experience as well as knowledge of organic and metallic pollutants. Experience in pollutant transport modeling highly desirable. Good communication skills imperative. Send resume and examples of previous work, published papers, and so forth, to:

s: Jacqueline Michel, Ph.D. Research Planning Institute, Inc. 925 Gervals Street Columbia, SC 29201

Faculty Position/University of Montana. The Geology Department of the University of Montana is inviting applications to Iill a temporary, one-year position at the Assistant Professor level (contract period will be from mid-September 1984 to early June 1985). This position involves replacement of a faculty member on sabbatical leave. Ph.D. in geology is preferred; however, M.A.'s with teaching or professional experience will be considered. Students planning to complete their Doctorate during the 1984–85 academic year are encouraged to apply. Teaching responsibilities include undergraduate courses and introductory geology, mineralogy, petrology (sedimentary), and a seminar in area of special interest.

Those interested should send a letter of applica-tion, resume, three letters of recommendation to: Arnold J. Silverman, Chair man, Department of Ge-ology, University of Montana, Missoula, MT 59812. The DEADLINE for applications is May 15, 1984. The University of Montana is an affirmative ac-tion/easts conceptuity amplications.

Faculty Position in Geophysics. Texas A&M University has a tenure track assistant professor position open starting in the fall of 1984. This is a new
position and we will consider applications from outstanding candidates in any area of solid earth geophysics. Preference, however, will be given to candidates with backgrounds and interests in exploration
geophysics, particularly in electrical and magnetic
methods. The Department of Geophysics at Texas
A&M currently has 17 faculty, 65 graduate students
and 100 undergraduate students. The current faculty research emphasis is in the following areas: exploration geophysics, engineering geophysics,
tectonophysics, internal earth structure, geodynamics, and general geophysics. Geophysics maintains
close contacts with the Orean Drilling Program and
Intends to participate actively in the Continental Scientific Drilling Program. The Department has a
VAX 11780 computer and has just moved into a
new building. verally has a lenure (rack

new building.
Applicants should send their resume and the names of three references by June 1, 1984 to E. Hoskins, Department of Geophysics, Texas A&M University, College Station, TX 77845.
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Postdoctoral in Field of Planetary Atmospheres, Start summer '84 for 12-month appointment, probably renewable, \$17,500. Preferred research interests: upper atmosphere seronomy (exospheres), climate modeling, radiative transfer. Send vitae to: Porfessor J.W. Chamberlain, Space Physics and Astronomy, Rice University, P.O. Box 1892, Houston, TX 77281.

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Postdoctoral Research Appointments/UCLA. Applications are invited for several anticipated appointments on the Research stall at the Space Science Group of the Institute of Geophysics and Planetary Physics, University of California, Los Angeles. The successful applicants will be expected to decore a substantial fraction of time to research and project activities in one or more of the following areas: physics of the Jovian magnetosphere including scientific investigations and data system development for the Galileo magnetometer; physics of the terrestrial magnetosphere, including analysis of ISEE and AMPTF data; studies of terrestrial UTF waves emphasizing either ATS 6 data analysis of theory; solar wind-planetary studies including analysis of Proneer Venus data.

Applicants for these positions should possess the

Venus data.

Applicants for these positions should possess the Ph.D. degree in a relevant area of physics, astronomy, or planetary sciences. Some experience with data analysis is desircable but not essential. A resume, opies of no more than three publications or preprints and the names of three references should be sent to. Dr. Mangaret G. Kivelson, Dr. Robert L. McPherron or Dr. Christopher T. Russell, Institute of Geophysics and Planetary Physics, 1971 & Loc Angelos CA 2002 1.

The University of California encourages applications from qualified women and minorities.

Assistant Curator/Texas A&M
University. Assistant Curator, Ocean Drilling Program, Texas A&M University, to oversee operations of ODP core repositiories, including calaloging and maintenance of collections, supervision of personnel, processing of sample requests according to JOIDES/ODP sampling policy, and participation in drilling cruises. Masters or PhD in sedimentology, paleontology, or related area preferred. Send letter of application, resume and names of four referces to:

to:

Dr. Russell Merrill, Curator and Manager of Science
Services, Ocean Drilling Program
P.O. Drawer GK
College Station, Texas 77843
Application Deadline is June 1, 1984.

Research Associate in Geochemistry/Petrology.

The Department of Geology, University of Oregon, invites applications for the position of Research Associate. Primary responsibilities will be to organize and obtain funding for independent research in geochemistry and petrology, and to supervise operations of the Department's XRF laboratory. Teaching advanced courses and supervision of

erations of the Department's XRF laboratory. Teaching advanced courses and supervision of graduate students is possible but not obligatory. Applicants must be familiar with modern analytical techniques, especially XRF, and should have a Ph.D. in one of the earth sciences.

Two-thirds of a nine month salary (\$13,700) will be assured. The remainder (\$6,850), plus summer salary (\$4,570) if feasible, will come from research grants or other funds generated by the successful applicant. Resume, together with bibliography and names of at least three references, should be sent to: G.G. Goles, Department of Geology, University of Oregon, Eugene, Oregon 97403, before 15 May. The University of Oregon is an affirmative action/equal opportunity employer and complies with Section 504 of the Rehabilitation Act of 1978.

University of Wisconsin-Milwaukee Faculty Posiand in Almospheric Sciences. The almospheric sciences program in the Department of Geological and Geophysical Sciences will have a tenure track position supported by state funds at the assistant professor level starting in September 1984. The applicant must have a PhD in meteorology or atmospheric science or a related field. Preference will be given to those who have a good unblication record

pitent must have a PhD in meteorology or atmospheric science or a related field. Preference will be given to those who have a good publication record and/or postdictoral experience. The successful applicant will be expected to develop a strong resourch and graduate program, and to teach undergraduate meteorology courses starting at freshman level. In the undergraduate major area, he or she will teach courses in advanced dynamics, mesonateorology and mesoscale modeling, in addition to courses related to the field of expertise. Usually two courses (6 credit hours) are assigned per semester.

Research opportunities at UV-Milwaukee include satellite metoorology, severe storm dynamics and energetics, diagnostic modeling, large-scale circulations and energetics, synoptic meteorology and mamerical modeling. Research facilities include McIDAS, Great Lakes Research Facilities include andidates should forward their resume to: Professor D.N. Sikdar, Chairman, Search Committee, Department of Geological and Geophysical Sciences, UV-Milwaukee, 1900 E. Kenwood Blvd., Milwaukee, WI 55211, with three letters of recommendation from professors and scientists well acquainted with the applicant's education background and 'research potential. Closing date for applications is 21 May 1984.

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and the talk is included in the monograph.
Unfortunately, Ronald Giovanelli finally sucof necessary modification) is included as the pers presenting the basic principles of maglast section of the book. netic reconnection, and papers describing re-cent observational and theoretical advances. Finally, I am pleased that the book will serve to introduce to many of its readers the Although the book is weighted toward space man who could appropriately be called the plasma interests (e.g., planetary magneto-spheres, comets, solar flares) there are also father of magnetic reconnection, the Austraversity in 1952. After lian physicist, Ronald G. Giovanelli. He was well known in the solar research community, treatments of reconnection in laboratory plas working 7 years in numus, particularly in fusion research devices clear reactor physics at but I feel that he probably was not known where a quite different view (in the words of the Argonne National generally among magnetospheric and labora-tory plasma physicists. Ron Giovanelli sug-V. M. Vasyliunas, "a same view") of magnetic Laboratory and the Savannah River Plant he gested the importance of magnetic neutral Allout a clozen of the papers presented at became interested in points in three pioneering papers in 1946, 1947, and 1948 in which he advanced a new the conference had been, or were soon to be, space research, which submitted to journals for publication. To entheory of solar flares. The subsequent develsure completeness of coverage of the conferopment of the concept of magnetic reconnecence subjects, extended abstracts of those pa-tion evolved from those works. He was invit-pers, provided by the authors, have been incould not attend because of a prolonged severe illness. Instead, he graciously sent me a

he pursued at the Convair Corporation it San Diego, the Institute for Defense Analysts in Wahington, D.C., the University of Iowa, and, since 1965, at the Los Alamos National, intel Laboratory. His primary space research inte

The Office of Naval Research is seeking a highly qualified marine geologist or geophysicist to serve as a Scientific Officer lo plan and manage a program of basic and applied contract research in marine geology and geophysics with emphasis in one of these two fields. The sponsored research is conducted principally at universities, government and industrial laboratories by leading scientists in the field. This is a Civil Service position located in Arlington, Virginia at the GM-13 (\$36,152-\$46,997) or GM-14 (\$42,722-\$55,538) level, depending on individual qualifications.

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Areas of research responsibility may include but are not limited to research, development and applications of modern geophysical techniques including, for example, single and multi-channel seismic methods; acoustic bollom interaction and subbottom propagation; crustal structure; marine gravity address below), to: and geodesy; and sediment dynamics.

requirements for a Ph.D. degree or equivalent in marine geology, geophysics or a related physical science or acquired a minimum of three years of progressively responsible professional experience. At least one year of experience, comparable in difficulty and responsibility to the next lower level in the Federal Service, is required. Demonstrated research experience in a marine environment is preferred. Equivalent combinations of professional experience and graduate education may be acceptable.

Interested persons should submit a resume or Standard Form 171, Personal Qualifications Statement (available at Federal Job Information Centers or from the

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Assistant Professor Position/Theoretical Physics.
The Physics Department at the University of Houston expects to fill several tenure track positions in theoretical physics at the assistant professor level. The farst of three may be filled in the fall of '81. The areas of interest are Condensed Matter. Non-Linear Dynamics, Phasma Physics (including Space Plasmas) and Statistical Mechanics. Our intention is to emphasize interdisciplinary activity within these broadly defined areas, It is desirable that candidates have an interest in interaction with other members. have an interest in interaction with other members of the dicory group and the experimental pro-

grams
Send resumes and three letters of reference to
George Reiter, Physics Department, University of
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COMPUTATION The Theoretical Division of the Los Alamos National Laboratory has available a postdoctoral research appointment for work on modeling the atmospheric radiation balance for climatology applications. Individual should be interested in and qualified to develop new computational solution techniques for the radiative transfer equation.

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Knowledge of computational methods to analyze solar radiative transfer through the atmosphere and experience in FORTRAN programming and handling of large data libraries is desirable.

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To apply, send a resume and a bief letter describing your research interests to:

Dr. S. Gersti, DIV-84-AY Theoretical Division MS B210 Los Alamos National Laboratory

Los Alamos, New Mexico 87545

Mineralogy/Department of Geology, University of Oregon. A position of Visiting Assistant Professor of Geology will become available on September 15, 1984. The successful candidate should have restarts interested in the control field of mineralogy. 15, 1984. The successful candidate should have re-search interests in the general field of mineralogy and crystallography and will be required to teach the one-year mineralogy course to geology majors. Teaching of one or more courses in specialized ar-cas of mineralogy is encouraged.

Departmental research facilities of interest to a inineralogist include UV-1R spectrophotometers, electron probe, SEM, neutron activation analysis, AA, XRF, XRD, and a high-resolution X-ray emis-sion spectrumeter.

AA, XRF, XRD, and a high-resolution X-ray emission spectrometer.

Applicants should have a doctoral degree or have substantially completed the requirements for it before taking up the appointment. Send corriculum vitae, bibliography, and statement of research interests, with names of three professional referees by May 15, 1984 to Chairman, Mineralogy Search Committee, Department of Geology, University of Oregon, Engene, Oregon 97403.

Salary dependent on qualifications.

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University of Arizona/Tandem Accelerator Mass Spectrometry. A position is available for a junior of experienced postdoctoral scientist at the National Science Foundation Facility for Radiosociope Analy-sis at the University of Arizona. The facility is used primarily to detect and analyze the presence of ¹¹C, primarily to detect and analyze the presence of "C, "Be and other rare isotupes in samples of scientific interest, and for research on applications of accelerator mass spectrometry. Half of the time on the facility is reserved for collaboration with off-site users, and the other half is used for in-house research programs. The person hired for this position will be responsible for physics aspects of the tandem accelerator and associated equipment, and will have the opportunity to develop research programs milizing the Facility. Salary will be commensurate with experience. Available now, Contact Professor D. J. Donahne, Department of Physics, University of Arizona, Tucson, Arizona 85721 (602-621-2480).

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The Colorado School of Mines. The Department of Geophysics of the Colorado School of Mines expects to have an opening for the acatemic year 1984-1985 for a candidate with experience in toal geophysics, earthquake seismology or seismic risk. The Department emphasizes geophysical exploration and applied geophysics, and preference will be given to the candidate who can bring that emphasis to his particular field of expertise. An extensive suite of field equipment and computers is available to support research projects, and the Department operates a seismic observatory that is part of the world-wide network. We expect that the appointment will be made at the Assistant Professor level; however, an accomplished scientis with a background in one of the areas of interest could be considered at a higher level. Please send applications, resumes and/or inquiries to: Philip R. Romig, Professor and Head, Department of Geophysics, Colorado School of Mines, Golden, Colorado 80401.

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Laboratory for Atmospheric and Space Physics.
The Laboratory for Atmospheric and Space Physics of the University of Colorado invites applications The Laboratory for Atmospheric and Space Physics of the University of Colorado invites applications for the position of Research Associate. We anticipate openings in active apace research programs in the disciplines of planetary atmospheres (including earth's atmosphere and comets), solar physics and astrophysics. LASP facilities include the operations control and data analysis center for the Solar Mesophere Explorer; an IUE Regional Data Center; and a complete space instrument design and fabrication facility. LASP also has experiments on Pioneer Venus, Voyager, Galileo and the Upper Atmosphere Research Satellite. In addition, five sounding rocket experiments will be conducted in 1984 and several of these will evolve to shuttle SPARTAN payloads over the next few years. LASP engineering lactitites allow the in-house design, fabrication and our modern computer facilities are tailored to sclenific data analysis and theoretical studies. The Laboratory is an institute of the University's graduate school and has close ties with the Departments of Astrophysical, Planetary and Atmospheric Sclences and of Aerospace Engineering. A doctorate in a relevant subject is required; salary in accord with experience.

Send letters of application with an undated results.

ience.

Send letters of application with an updated resume and the names of two references to:

A.I.F. Stewart

University of Colorado

L.A.S.P.

Campus Box 8-10 Boulder, CO 80301 Applications are being accepted on a continuing

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Postdoctoral Position in Upper Atmospheric Physics. A postdoctoral position is available in the Space Physics Research Laboratory at the University of Michigan for a qualified candidate with a Ph.D. degree and experience in Upper Atmosphere Physics. The position involves the analysis of data obtained from two instruments flown on the NASA Dynamics Explorer-2 satellite. The extensive satellite data base provides detailed information of the Dynamics, Thermodynamics and Compositional Structure of the Neutral Upper Atmosphere. The appointment will be for one year (renewable) and is to start in October, 1984. The applicant should identify and describe areas of his or her expertise that can support theoretical investigations in Upper Atmosphere Physics. A resume and the natures of three persons knowledgable of the applicant's experience should be forwarded to:

Dr. T.L. Killeen
Space Physics Research Lab.

Dr. T.L. Killeen
Space Physics Research Lab.
Department of Atmospheric and Oceanic Sciences
The University of Michigan
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Announcements

AAAS Atmospheric and **Hydrospheric Sciences**

May 24-29, 1984 American Association for the Advancement of Science (AAAS) Annual Meeting, New York, N. Y. (Bernice Ackerman, Secretary, Section W. P.O. Box 5050, Station A, Champaign, IL 61820; tel.: 217-333-1702.)

Section W (Atmospheric and Hydrospheric Sciences) is sponsoring four symposia at the AAAS national meeting. On May 27 will be "El Niño and the Southern Oscillation." The topics on May 28 will be "Agricultural Production in Anomalous Weather Conditions" and "Is the Earth's Biota an Important Contributor to the Increase in COs in the Atmosphere?" The fourth symposium, on May 29, portant Tree Species."

Arctic Science Conference

October 3-5, 1984 1984 Arctic Science Conference (35th Alaska Science Conference), Anchorage, Alaska. Sponsor, AAAS Arctic Division. (John Davies, P.O. Box 80271, Fairbanks, AK 99708; tel.: 907-474-

Titles of abstracts should be submitted by June 1, 1984.

Abstracts are due July 30, 1984. (Titles and abstracts for the Meteorology and Oceanography Symposium should be sent to Stuart Bigler, National Weather Service, P.O. Box 28, Anchorage, AK 99513; tel.: 907-271-

Papers are invited on any area of northern science. There will be special sessions during the meeting on Vegetation, Inventory, and Mapping; Pure and Applied Mathematics; and a Special Program for High School Students. There will also be six symposia on the following topics: Science and Public Policy.

Earthquake Hazards Reduction, Meteorology and Oceanography of American High Latitudes, and Science Education: Issues and Problems in Alaska, the Yukon, and Northwest Territories.

Watershed Management

April 30-May 1, 1985 Symposium Watershed Management, Denver, Colo. Sponsor: American Society of Civil Engineers. (E. Bruce Jones, President, Res Consultants, Inc., P.O. Box Q, Fort Collins CO 80522.)

The deadline for submitting abstracts is

The theme for the meeting will be "Water shed Management in the 80's: New Directions" tions," and papers are solicited on topics rele vant to that theme. Suggested areas of conhydrology, modeling and simulation, hydro logic methods and processes, snow manage. ment, state-of-the-art appraisals, and water shed management case histories.

Ogallala Aquifer

June 5-6, 1984 Ogallala Symposium Lubbock, Tex. Sponsors: Texas Tech Uni sity Water Resources Center, Internal Center for Arid and Semi-Arid Land Studi Center for Arid and Semi-Arid Land Semi-High Plains Underground Water Conservation District No. 1, Panhandle Underground Water Conservation District, Oklahoma State Univ. Div. of Agriculture, USGS. (WRC, Texas Tech University, Lubbock, TX 79409, id. 806-742-3697.)

806-742-8597.)

The symposium will deal with recent studies of the Ogallala Aquifer, a vast under ground water formation underlying portions ground water formation underlying admineration. of eight states, and will also examine advances in groundwater research in general vances in groundwater research in general Among the topics will be hydrologic and get logic characteristics, aquifer recharge water and contaminant sampling and transport aquifer sugmentation and conservation, and eling, economic factors, and aquifer development and decline. Speakers from the U.S. Departments of Agriculture and Interior. from state agencies, universities, and private engineering and consulting firms are scheduled to present technical papers.

Canadian Hydrology Symposium

June 10-12, 1984 Canadian Hydrology Symposium 1984, Quebec, Canada. Sponsor: National Research Council of Canada Associate Committee on Hydrology. (H. R. White-ley, School of Engineering, University of Guelph, Guelph, Outario N1G 2W1, Cana-

The symposium will deal with the interaction between hydrological processes within watersheds and the substances that determine water quality. The study of substances transported by water, their sources, and the pathways along which they move, will be particu-larly emphasized. Specific topics scheduled for discussion include: atmospheric inputs and their impact on water quality; land use as a determinant of water quality; constituents and processes in urban runoff; water quality evolution in rivers, lakes, and reservoirs; overland runoff processes; and the use of deterministic and stochastic hydrological models.

New Listings

June 25-27, 1984 Technology Transfer Society Ninth Annual Meeting and International Symposium, Boston, Mass. (Margaret McNamara or Jack Griffin, Naval Underwater Systems Center, New London, CT 06320; tcl.: 203-440-4590 or -4116.)

July 22-28, 1984 Eighth World Conference on Earthquake Engineering, San Francisco. Sponsor: Earthquake Engineering Research Institute. (J. Penzin, Earthquake Engineering Research Institute, 2620 Telegraph Ave., Berkeley, CA 94704; tel.: 415-848-

August 26-29, 1984 Geothermal Resources Council Annual Meeting, Reno, Nev. (Geothermal Resources Council, P. O. Box 1350, Davis, CA 95617; tel.: 916-758-

September 28-29, 1984 Tectonic Geomorphology—15th Annual Geomorphology Symposium, Binghamton, N.Y. Organizers, Marie Morisawa and John Hack. (Marie Morisawa, Dept. of Geological Sciences, SUNY, Binghamton, NY 13901; tel.: 607-798-2615.)

October 16-18, 1984 Statistics Symposium on National Energy Issues, Scattle. Wash. (Robert Kinnison, Statistics Section, Pacific Northwest Laboratory, P.O. Box 999, Richland, WA 99352.)

AGU Membership Applications

Applications for membership have ben received from the following individuals. The letter after the name denotes the proposed primary section affiliation.

Gladees Abdypoor (T), Sampson A. Acheampong (H), M. M. Aral (H), Alan Bar-nett, Ulrich R. Christensen (T), Herbert A. Cohen (SM), Balaranı Dey (A), Augusto Gheui (H), Thomas W. Giambelluca (H), William C. Keene (A).

Robert W. Lichty (H), Raymond Luebbers (A), Robert B. Lundahl (T), Kazuo Makita (SM), Joel Marko (S), Edward C. Mozley, Hitonori Ono (H), A. M. Sereci (S), Edward H. Tenner, Leon Wittwer (SM), Toshitsugu Yamazaki (GP), Gonzalo A. Yanez Carrizo (GP).

Student Status

G. D. Earle (SM), John Flinn (G), Yousef D. Gumati (T), Jeffrey W. Johnston (T), Thomas J. Kerr (G), Peter T. May (A), Jim E. O'Connor (H), Angelos Protopapas (H), Michael Ravine (P), J. Milo Robinson (C), Raylan H. Roetman (A), Jefferson R. Snider (A), Douglas K. Solomon (H), Harlan E. Spence (SM), David A. Wark (V), Stuart A. Weinstein (S), Carolyn M. Zehnder (S), Yuanchong Zhang (G).

Correction

In the article,"AGU Scholars," which appeared in the March 13, 1984, issue of Eas (p. 101), the affiliation given for Charles R. Elerson was listed incorrectly. He is currently enrolled at the University of Wisconsin-Milwau-

Plan on San Francisco Nowl AGU Fall Meeting December 3 -7, 1984

Separates

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Planetology

Planetology

6343 Interiors of planets

YENUS BANDEN TERRAIN. TECTOMIC MODELS FOR RAND FORMATION
AND THEIR RELATIONSHIP TO LITTORPHERIC THERMAL STRICTURE
Beam G. JOLOGOM (Department of Earth, Atmospheric, and
Planetary Sciences, Messandhassatts institute of
Technology, Cambridge, Mass. 01197) and James V. Mead
Racent rader langes of the Squateles of Ichter Terra,
Yenus, at approximately 1-he rader resolution show a
series of linear bands of sitematively greater and
lesser backsontier; the bands are generally sligned with
the topographic strite of the mountain ranges. We test
the hypothesis that these band features are tecroic in
origin, the prodect either of feliding during lithespheric
compression or of block faulting during lithespheric
extension. Tested models for feliding include uniform
elastic and viscous plates overlying invisuid substrates,
layared plates, and a viscous balfapace in which
viscosity decreases exponentially with depth. The
uniform plate models can preduce folds at a dominant
wavelangth equal to the characteristic spacing between
hands on Vanue, about 15 to 20 kg. if the classic or
ligh-viscosity layer is at most a few kilomaters in
thickness, though the tequired compressive excesses are
severel kilobars in magnitude. For the case of an
exponentially decreasing viscosity, the skin depth plays
the role of layer thickness and similar reseits hold.
Layered alastic or viscous plates, however, can fold at
the required wavelength with sub-kilober attenses, and
are therefore favored over uniform plates models. Tested
extensional models include grahm and herea formation in
a surface elastic-brittle layer, inbrincate normal
faulting, and necking of a surficial layer that is
everywhere in a state of extensional failure. The
apacting between beinds on Venns if the serficial
brittle layer is no nove than a few kilobeters in
thickness. Both compressional and extensional models for
thein passing between bands on Venns if the serficial
brittle layer is no nove than a few tilobeters in
thickness. Both com formed contemporaemously with the countain ranges of lehter Terre as a result of borisontal compression of Yenus lithosphers. Independent arguments on the therm structure of the Yenus crust and the mechanical behavi attricture of the Yamas crust and the mechanical behavior of summed, rocks as a function of temperature indicate that the elastic lithosphere of Yamus is approximately 1-10 has thick. We therefore suggest that the surficial layer of elastic-brittle or high-viaconity behavior required for other the compressional or extensional models may in fact be the elastic lithosphere of the Yamus highlands at the time of band formation. (Yemus tectonics, banded torrain, elastic lithosphere) tertonics, banded terrain, clastic lithosphere) J. Geophys. Res., S. Paper 480436

Seismology

6920 Explosion Saismology
A COMPARISON OF VELOCITY AND ATTRUMATION BETWEEN
THE NICOBAR AND BENGAL DEEP SEA FANS
R.S. Jacobson (College of Oceanography, Oregon State
University, Corvallis, Oregon 9731), U.G. Shor, Jr.,
Michal Bee
The compressional wave velocity and attenuation
measurements from a deep-source, deep receiver saismic
refraction experiment from the Micobar Fan, Indian
Ocean, are presented and compared to a similar set
of measurements in the Bengal Fan. The two deep
sea fans consist of thick sections of turbidites,
derived from the same sediment source, but have
slightly different depositional histories. Travel
time inversion of the data into a velocity depth model
uses the teu-seta linear inversion acheme. We
present a revised reparameterization of the travel
inversion process. Although the velocity structures
with depth are morphologically similar, there
exist discrete differences between the bos stations.
In the Nicobar Fan, the initial velocity (assumed)
is 1,513 km/s, with an initial gradient of 2.22 sec⁻¹.
The velocity increases smoothly with depth, while
the velocity increases smoothly with depth, while
the velocity gradient decreases repidly to a constant
d.81 sec⁻¹. The Bengal fan station showed the tame
trend, although the velocity gradient at depth was
only 0.67 sec⁻¹. The attenuation profiles are similar
only in gross structure, with the Nicobar Fan values
of Q⁻¹ being a factor of 3 to 4 less then the Bengal
station. The differences in velocity and attenuation
structure can be attributed to a number of causes,
including pornally and sedimentation retax (Which
are related to the distance from the sediment source),
and the presence of overburden pressure. It
is believed that pornsity changes, due to whatever
cause, dominate the lateral and vertical variations
of velocity, velocity gradients, and (together with
introbad multiples) attenuation in thick sedimentary
sections. (Attenuation, profice in the sedimentary
sections. (Attenuation in thick sedimentary
sections. (Attenuation in t

6950 Seismir sources RFFECTS OF PRYSICAL PAULT PROPERTIES ON FRICTIONAL INSTABILITIES PRODUCED OF SIMULATED PAULTS P. G. Okubo (United States Caslogical Survey, NS 977, 145 Middlefield Soad, Haplo Fark, CA 94025) and J. H. Distances

P. G. Okubo (United States Geological Survey, MS 977, 145 Middlefield Bood, Mendo Park, CA 94025) and J. H. Distarich.
Laboratory studies of large-scale simulated facine show that physical properties of the feult, specifically normal acress and fault roughness, significantly influence the metable sheer failure behavior of the fault. In addition, the experience provide insights late input of the fault. In addition, the experience provide insights late input of the for savesing concepts such as critical crack length or rupture mucleation dimension. Sitch-slip shear failures have been generated along a 2-w-long significant ware conducted at normal streams between G. A and 4 NPs with two different propered roughnesses of the situalised fault: a swooth fault with a profilement were roughness of 0.80 as. High-speed records of shear strains and slip wellecties clearly show both the propagation of the sold-slip failures and details of the local deformations and motions from which slip weakening of the fault at the enset of sliding can be resolved. Bath the dynamic stress drope of the sticknessity avents and the apparent fracture energies of the such shear with increasing normal acress. Although critical milip-wakening displacements are leasured fault roughness such that apparent fracture energies are also larger on the rough fault than no the energies are also larger on the rough fault than no the energies are also larger on the rough fault than no the energies are also larger on the rough fault than no the shooth fault. Silp velocities in these superiments are influenced by renginess and are propertional to screen drop. Although the court of silp is serge gradual, without a clear rough fault are lower than those on the suboth fabit.

PLATE RECONSTRUCTION FROM PALEOZOIC **PALEOMAGNETISM**

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When a length scale based on rupture nuclestion dimensions, directly proportional to critical displacements, is introduced, the data suggest that at fault langths close to the nuclestion lengths rupture velocity and slip velocity increase with increasing fault length. (Stick-slip, frictional inscality). J. Geophys. Res., B. Paper 480399

A. Geophys. Res., B., Paper ANG199

6950 Seiseic Sources

MEMENT-MACHITUSE RELATIONS IN THEORY AND PRACTICE

Thomas C. Hanks (U.S. Geological Survey, 345 Middlefield Road, Menio Park, CA 34025) and Devid M. Boors

The observation that motivates this study is the difference in c-values in amment-magnitude relations of
the form log M. = cM, - d between central and southern
California. This difference is not at all related to
geographical ares; rather, it results from positive
curvature in the log M. - M. Plane and the relatively
large musber of M. < S earthquekas in the central California dats set. With the prescription that the ferfield shear waves from which M. is taken be finiteduration, band-limited, white Gaussian noise in acceleration, we can estimate M. as a function of M. sions,
by fixing the stags stress drop at 100 bars and fear at
15 Mr. These model calculations fit evaluble California moment-magnitude data for 0 € M. € 7, 101° N.
5 1028 dyne-cm with striking accuracy. This range in
source atrength is entire: earthquakas with M. > 1028
dyne-cm are unlikely to occur in California, at
least under ordinary conditions of recording earthquakes
at ordinary hypocentral depths. More fundamentally,
the remarkably good fit of model to data lapites that
the span atress drop of 100 bars (to a factor of two
rso) is a stable and pervessive feature of all (M. È
24) California earthquakas whose spectral course fre-2kg California earthquakes whose spectral towner functory lies in the "visible" bandwidth, $f_0 \le f_{max}$. J. Geophys. Res., B. Paper 480432

Agno Structure of Trust and Upper Mantle
Troitrief Ann variability of Granic Court on the Flance
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Return 19

6970 Structure of the Crust and Upper Montle GEOLOGIC AND SEISMIC VELOCITY STRUCTURE OF THE

Ophicitie Complex show that while a typical layered ophicitie muite is present, the thickness of major lithologic units is extremely variable from place to place. The composition and internal structure of mep-scale (kilometers across) lithologic units as well as the contact that bound them are laterally variable. Inferred valocity-depth functions of the crust/mantle (19080-) transition reconstructed for this terrans as accepted themshore agreement. crust/mantle ('MOMO') transition reconstructed for this turrene as present lithosphere suggest an extremely complex (thermal sainale structure. The crust/mantle transition from mefic to ultransfic lithologies varies scross the opholita from a sharp geologic and seismic velocity discontinuity to a complexly interlayered transition come as much as I has thick. The mefic/ultransfic transition is characterised by laterally discontinuous lithologic units on the order of hundreds of maters to a few tilometers thick and up to several kinesters long. These units (segalonses) may be composed of lithologies white (segalonses) may be composed of lithologies white (segalonses) may be composed of lithologies with higher or lower sairale velocities them those of the surrounding units. Solid-state deformation has produced scismolatly selective than those of the surrounding units. Solid-state deformation has produced scismolatly selective units. Substantial relief and slopes of up to at least 12 degrees over lateral distances of shout 10 km occurs on the top of the crust/mentle transition sope as all a substantial collection to the collection of the collection o on the top of the crust/mantle transition some as well as other geological relations. Although these types of geological Features are striking to the flekd, geological tworking in ophicalities and are significant to the understanding of crustal accretion processes, many of these occur on such a small scale that they might go undetected in different types of selecte experiments in contemporary occanic lithosphere. ('MORO', Occapic Crust, Mantle, Ophicalities)
J. Gambhan, Bas. B. Fanar 480522

· Grophys. Res., B. Paper 480322 Social Sciences

7399 General (Reservoir Management)
A DESCRIPTIVE DECISION PROCESS NODEL FOR HIERARCHICAL
MANAGEMENT OF INTERCONNECTED RESERVOIR SYSTEMS
R. liker Adapted and Osman Coghunoğlu (Department of
General Engineering, University of Illinois, Urbane,
Illinois, 61801)
A significant limitation of prescriptive optimization
models is that their formulation is disessociated from
the behavioral and organizational attributes of the
problem addressed. In an attempt to alleviate this
limitation, a decision process model is formulated
directly within a fyamemork of decision agents involved
in integrated long- and short-term planning and minagement
of multipurpose and multireservoir system operations. The
resulting model is hierarchical, smultilevel, multilayer,
and decentralized, As such it is descriptive of a reservoir system managed and operated by geographically separated multiple agents having different authorities and
responsibilities. Robustness and purformance of the
model is investigated using the Shasta-Trinity System of
Californic as an example. Results are encouraging for
the descriptive at vall as prescriptive relevance of the
model, (Maservoir panagement, decision model).
Vater Resour: Res., Paper 400279 Vater Resour: Res., Paper 490279